

REMARKS

Claims 1-44 are pending in the application.

Claims 1-44 stand rejected.

Rejection of Claims under 35 U.S.C. §102

Claims 1-6, 11, 12, 20-24, 28-34, and 38-44 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,641,411 (hereinafter referred to as “Stoddard”). Applicants respectfully traverse this rejection.

With respect to claim 1, the cited art fails to teach or suggest an arrangement in which “the first pair of vias is positioned in a first plane, each point in the first plane is substantially equidistant from each via in the second pair of vias, the second pair of vias is positioned in a second plane, [and] each point in the second plane is substantially equidistant from each via in the first pair of vias,” as recited in claim 1. For at least this reason, claim 1 is patentable over the cited art.

The Examiner primarily relies upon FIG. 2 of Stoddard in the rejection of claim 1. Final Office Action (FOA), p. 2. In Stoddard, “differential signals are organized in connectors such that differential signal pairs are orthogonal to each other.” Stoddard, Abstract. As shown in FIG. 2, a rectangle is drawn around a first pair of vias 203, which the Examiner equates with the “first pair of vias” of claim 1. This rectangle abuts another rectangle encircling a second pair of vias 205, which the Examiner equates with the “second pair of vias” of claim 1.

Claim 1 requires that the “the first pair of vias is positioned in a first plane, each point in the first plane is substantially equidistant from each via in the second pair of vias.” In contrast, Stoddard’s FIG. 2 shows a situation in which each point in the first plane (e.g., the plane that includes vias 203) is clearly not equidistant from each via in the second pair of vias 205. For example, via 209 (which is one of vias 203 and thus one of the points in the plane that includes vias 203) is clearly not “substantially equidistant” from vias 211 and 213 (which are the two vias in vias 205). In particular, via 209 is clearly much closer to via 211 than via 213. This is especially clear since via 211 is interposed directly between via 213 and the plane that includes vias 203, making it clear that via 211 is necessarily much close to the plane that includes vias

203 than via 213. Thus, the points in the plane that includes vias 203 are clearly not substantially equidistant from each via in vias 205. For at least this reason, claim 1 is clearly patentable over the cited art.

Furthermore, Stoddard neither teaches nor suggests an arrangement of vias like that described in claim 1. In Stoddard's abstract, the pairs of vias are described as being orthogonal to each other. All of Stoddard's figures show arrangements in which a rectangle containing one pair of vias is perpendicular to and non-overlapping with a rectangle containing another pair of vias. *See, e.g.*, Stoddard, FIGs. 2-5. Thus, in each situation, one via in the second pair of vias will be significantly farther away from each point in the plane that includes the first pair of vias than the other via in the second pair of vias. The cited portions of Stoddard neither teach nor suggest that an arrangement in which both pairs of vias are located in respective planes that are substantially equidistant from each via in the other pair of vias, as recited in claim 1.

Claims 2-6, 11, and 12 depend from claim 1 and are thus patentable over the cited art for at least the foregoing reasons presented above with respect to claim 1. Claims 20-24, 28-34, and 38-44 are patentable over the cited art for similar reasons.

Claims 14-18 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication No. 2005/077977 (hereinafter referred to as "Beale"). Applicants respectfully traverse this rejection.

As noted in the prior response (mailed June 21, 2006), the cited art does not teach or suggest:

a first pair of vias in the substrate; and

a second pair of vias in the substrate, wherein

the first pair of vias is configured to convey a first signal pair comprising a first positive signal and a first negative signal,

the second pair of vias is configured to convey a second signal pair comprising a second positive signal and a second negative signal,

the first pair of vias is positioned relative to the second pair of vias such that a crosstalk effect caused by the first signal pair on the second positive signal reduces a crosstalk effect caused by the first signal pair on the second negative signal.

As shown in Fig. 3 of Beale and described in the corresponding description, the arrangement of vias at both ends of the signal lines affects the crosstalk between the two signal pairs. For example, at one end, via 14 is located close enough to via 24 that signal 12 (conveyed by via 14) and signal 22 (conveyed by via 24) will experience electrical coupling. At the other end, via 16 (which also conveys signal 12) is located close enough to via 30 that signal 12 (conveyed by via 16) and signal 22' (conveyed by via 30) will experience electrical coupling. See also Beale, paragraphs 35-37. Each place where electrical coupling occurs is explicitly labeled in FIG. 3. Accordingly, four pairs of vias (two pairs at each end) are used to achieve the electrical coupling between the different signals that ultimately reduces the effects of crosstalk in Beale's system.

In other words, the impact of crosstalk between signals conveyed via a set of two pairs of vias (e.g., one pair including vias 14 and 18 and another pair including vias 24 and 28) in Beale's system are substantially canceled out by the impact of crosstalk at the other set of two pairs of vias (e.g., one pair including vias 16 and 20 and another pair including vias 26 and 30), which are located at the other end of the signal lines. "As such, in operation, the amount or impact of crosstalk between signal lines 12 and 22 (at vias 14 and 24) is equal or substantially equal to the crosstalk between signal lines 12' and 22 (at vias 20 and 26). Similarly, the amount or impact of crosstalk between signal lines 12 and 22' (at vias 16 and 30) is equal or substantially equal to the crosstalk between signal lines 12' and 22' (at vias 18 and 28). As coupling is reciprocal, the equal or substantially equal coupling exists between signal lines 22/22' to signal lines 12/12' such that any difference in coupling between signal lines 22/22' to 12/12' is negligible (or not detrimental) to the operation of the communications system." Beale, paragraph 37. Thus, the reduction of the crosstalk in Beale's system depends on the arrangement of four pairs of vias: vias 14 and 18, vias 24 and 28, vias 20 and 16, and vias 26 and 30, where two pairs of vias are located at each end of the four signal lines.

In contrast, in claim 14, a first pair of vias is configured to convey the first signal pair comprising a first positive signal and a first negative signal, and the second pair of vias is configured to convey a second signal pair comprising a second positive signal and a second negative signal. The first pair of vias is positioned relative to the second pair of vias such that a crosstalk effect caused by the first signal pair on the second positive signal reduces a crosstalk effect caused by the first signal pair on the second negative signal.

Thus, in the arrangement of vias described in claim 14, the first signal pair has crosstalk effects on both the second positive signal and the second negative signal and these crosstalk effects reduce each other. In contrast, Beale shows a system in which two pairs of vias (vias 14 and 18 and vias 24 and 28) are arranged such that one signal within a first signal pair (signals conveyed by signal lines 12 and 12') has an effect on the positive signal (conveyed by signal line 22) in the second signal pair due to the coupling that occurs between vias 14 and 24. Beale, FIG. 3. Similarly, one signal within the first signal pair has an effect on the negative signal (conveyed by signal line 22') in the second signal pair due to the coupling that occurs between vias 18 and 28. However, in Beale's system, the crosstalk effects caused by these two electrical couplings do not reduce each other. Instead, each of these crosstalk effects is reduced by complementary crosstalk effects that arise at the other end of the signal lines (e.g., the electrical coupling between vias 20 and 26 counteracts the electrical coupling between the signals conveyed at vias 14 and 24), as described in paragraph 37 of Beale.

Furthermore, Applicants note that the electrical couplings induced at a given end of Beale's system (and that thus arise due to the arrangement of only two pairs of vias) are not between a pair of signals and a single positive or negative signal; instead, each of the electrical couplings involves only one signal from each pair. *See, e.g.*, Beale, FIG. 3. Thus, within the arrangement of two pairs of vias shown at each end of Beale's system, a given pair of signals does not simultaneously cause crosstalk effects in either positive or negative signal of a second pair of signals.

If only two pairs of vias are used in Beale (e.g., vias 14 and 18 and vias 24 and 28), crosstalk effects are induced but not reduced. Thus, using only two pairs of vias as described in Beale would not have the same effects as Applicants' system. Instead, using only two pairs of vias arranged as described in Beale is likely to only increase crosstalk without providing any way to produce a corresponding reduction in crosstalk.

Thus, in claim 14, two pairs of vias are arranged so that crosstalk effects on one signal within a pair reduce the crosstalk effects on the other signal within the pair. Such an arrangement of vias is not shown in the cited portions of Beale which, as described above, requires four pairs of vias to obtain desired crosstalk reduction, rather than the simpler arrangement of two pairs of vias used by the claimed invention. For at least this reason, claim 14 and its dependent claims 15-18 are patentable over the cited art.

Nevertheless, on page 12 of the Final Office Action, the Examiner states:

Beale specifically states, ‘the amount or impact of crosstalk between signal lines 12 and 22 (at vias 14 and 24) is equal or substantially equal to the crosstalk between signal lines 12’ and 22(’) [sic - this is actually signal line 22, as described in paragraph 37 of Beale and as explicitly shown in FIG. 3 of Beale] (at vias 20 and 26).’ Thus, Beale teaches that a simple arrangement of two pairs of vias is sufficient to achieve the desired reduction in crosstalk.

However, this statement overlooks the fact that claim 14 requires that the two pairs of vias each be configured to convey a respective pair of signals. In the passage of Beale cited by the Examiner, there are only three signals (not two pairs of signals) involved: the signals conveyed by signal lines 12, 12’, and 22 (contrary to the quoted portion of the office action, via 26 is coupled to signal line 22, not signal line 22’, as can be clearly seen in FIG. 3 of Beale). Thus, the cited portion of Beale quite clearly does not show the desired reduction in crosstalk between two pairs of signals using a single arrangement of two pairs of vias.

Rejection of Claims under 35 U.S.C. §103

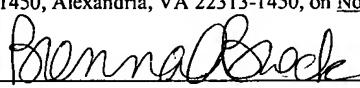
Claims 7-10, 25, 26, and 35-37 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,641,411 (Stoddard) in view of U.S. Publication No. 2005/0077977 (Beale). These claims are patentable over the cited art for at least the foregoing reasons presented above with respect to claim 1.

Furthermore, there is no suggestion to combine the references. As described in detail above, each reference teaches a very specific arrangement of vias, and the arrangements taught by each reference are quite different than each other. Accordingly, there is no suggestion to simply incorporate one reference’s arrangement into the other, since doing so is likely to erase the particular advantageous signal effects caused by the other reference’s arrangement.

CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the Examiner is invited to telephone the undersigned at 512-439-5087.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on November 20, 2006.



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11/20/2006
Date of Signature

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